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Managing Water for Quality Results

Cover: Enhancing water quality is a major concern and is a responsibility of all. The Soil Conservation Service helps land users manage their lands and encourages people to use the voluntary approach in managing local water quality concerns. (Tim McCabe photo)

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Comments from the SCS Chief:

Taking the Initiative on Water Quality

Of all environmental issues, water quality has become one of the most important. No one knows this better than the people in agriculture. We're mindful of water quality on our farmsteads and ranches. We're equally mindful that the broader society is scrutinizing our response to concerns about nonpoint source pollution. Protecting our water resources, in both quality and quantity, is a high priority for agriculture.

On America's farms and ranches, there is a concerted effort to bring soil erosion under control while sustaining both the quality of the environment and the economic viability of agricultural operations. Farmers are making more prudent use of agricultural chemicals. They are working "smarter," using new technologies such as crop residue management and integrated pest management. They are accelerating their efforts to put their conservation plans on the ground and thereby retain their eligibility for U.S. Department of Agriculture program benefits.

Farmers now have the opportunity to take advantage of the Water Quality Incentive Program. This 1990 farm bill program was kicked off with a signup in February. It provides incentive payments to agricultural producers who modify their management practices to achieve reduction at the source of agricultural pollutants. The goal is to enhance and protect surface and ground water.

Other water improvement legislation is in the forefront as well. The Clean Water Act is up for reauthorization. The current provisions of Section 319 (nonpoint source pollution) are fairly sound. We need to ensure that any requirements imposed on agriculture are reasonable and achievable and based on sound technology. We need to counter the arguments of those who advocate a more direct regulatory approach. Our philosophy is that we will accomplish more through education and technical assistance than we ever would through regulation.

Looking beyond the law, total resource management has become the watchword. There's no mystery about this phrase—it means finding the optimum system of practices that is good for the soil, water, air, plants, and animals and for the producer's profit margin. More specifically, it means respecting the environment while operating in a profitable and productive manner.

Everyone must work together to ensure that our approaches to the environment are reasonable and practical, and compatible with the need to produce food and fiber for a growing and more complex world.

Chief

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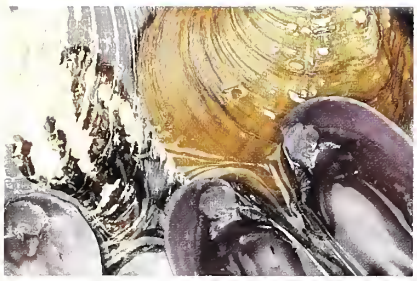
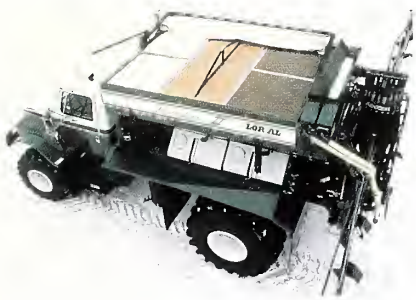
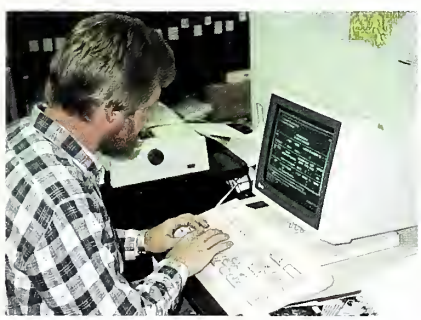






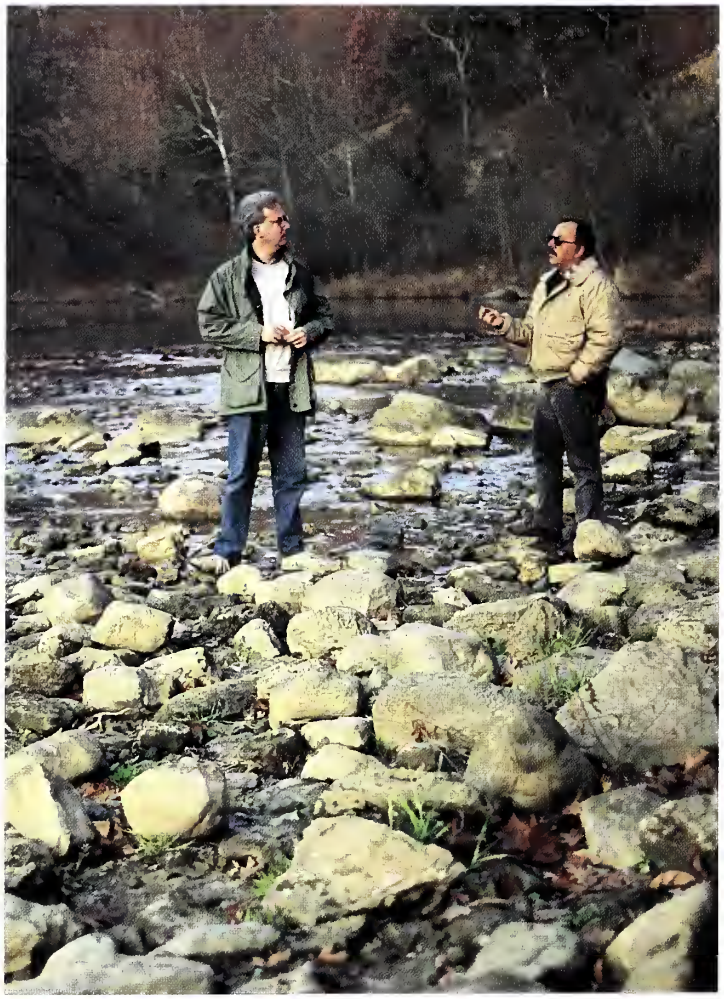
Ohio's Darby Creek Gains from Cooperation

WATERSHEDS know no political boundaries. Darby Creek in west-central Ohio meanders in and out of rolling terrain, through 31 townships, across 6 county lines, and over a wide, flat plain of farms and suburban upwellings.

As these traditional lines of division are crisscrossed by the watershed, so too are the lines of people intermingling to preserve Darby Creek.

The 80-mile-long creek is recognized as a unique place, "a last great place," a scenic river. Its exceptional water quality has prompted local landowners, units of government, nonprofit groups, universities, agencies, and private corporations to come together as partners in protection. Darby Creek, designated as a scenic river by the State of Ohio, is free flowing and biodiverse.

"There are well over 25 partners and organizations involved in this project," said Steve Jordan, Darby Creek project coordinator for The Nature Conservancy in Ohio. "The number of political jurisdictions involved makes the use of partners necessary.



Steve Jordan, Darby Creek project coordinator for The Nature Conservancy Ohio Chapter, left, discusses hydrologic unit work with Wes Beery, SCS conservationist. (Michelle Lohstroh photo)

"The ideal situation is when the land-protection effort produces the desired conservation results, as well as economic and cultural benefits. A good example is the recent designation by the U.S. Department of Agriculture of this watershed as a hydrologic unit.

"Biological monitoring efforts by our scientists, The Ohio State University, the Ohio Environmental Protection Agency, and the Ohio Department of Natural Resources will all contribute to the future direction of the partners' protection efforts," added Jordan.

"This free-flowing stream retains its native beauty and water quality," said Mary Ann Core, Soil Conservation Service water quality coordinator for the Darby Creek project. "There are over 80 species of fish, plus a diversity of mollusks. And the Darby supports over 35 rare or endangered species."

Corporations are also coming forward to champion the work on the Darby.

An example of landowner and agency cooperation occurred during the fall of 1991. A section of the Darby became jammed with logs. Linda McGuire and three neighbors were affected.

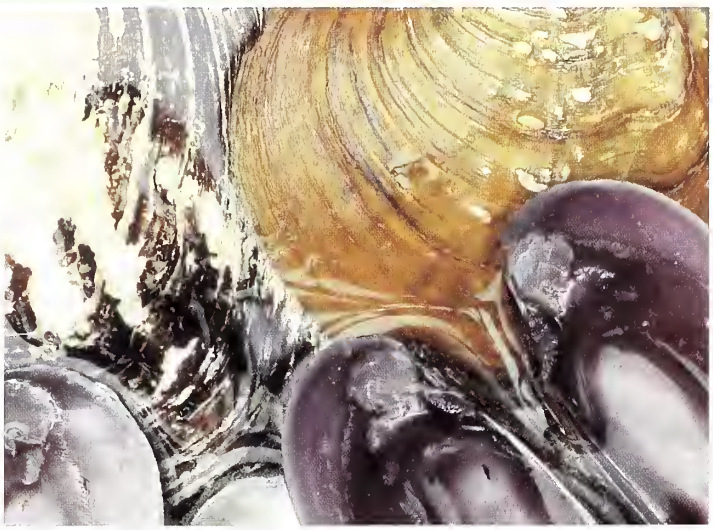
"The logjam was 15 feet high before work began," said McGuire, who farms over 1,000 acres in Champaign County. "My farm [sometimes] gets flooded, but this time we had water in places I hadn't seen it in in 27 years. And the field drainage tiles weren't working." Agency cooperation helped McGuire and her neighbors clear the logjam.

"I read an article about money being available to do water-quality work on Darby Creek, so I visited the Champaign Soil and Water Conservation District office. I had good cooperation from other landowners," McGuire added.

McGuire and her neighbors have been accepted in the Conservation Reserve Program. A 1-mile-long by 50-foot-wide filter strip of hardwoods is planned on both sides of the stream. McGuire expects to have harvestable trees in the future.

Other farmers are receptive and interested in keeping the water clean. And they are working to apply conservation measures to the land to control sedimentation and runoff pollutants. Don Bailey is one of those farmers.

Bailey, a Union County farmer, wanted to protect his farms from erosion. He wanted to keep production costs down and to save money and time. Bailey rented and used the local district's no-till planter, and he installed other conservation practices on rented farm ground as well as on his own land.



Forty species of freshwater mussels thrive in Darby Creek in west-central Ohio. Some species have orange or purple colors, or brown-and-white mottling. (Lloyd Lemmerman, Ohio Cooperative Extension Service photo)

Corporations are also coming forward to champion the work on the Darby. "We feel that support of this watershed project is a natural extension of Honda's corporate

Pilot Effort Improves Ohio's Indian Lake

The Indian Lake hydrologic unit area (HUA) is a pilot project in west-central Ohio to help improve water quality. Over the years, Indian Lake has suffered sedimentation from cropland and streambank erosion.

Like nearby Darby Creek, efforts at Indian Lake involve many cooperating agencies. HUA conservation work at Indian Lake began nearly 3 years ago; work at Darby is just beginning. The Soil Conservation Service provides technical assistance.

Success with Indian Lake has been based on landowner input. Ideas evolved into projects with financial support.

With State funds, Indian Lake HUA pays $4 per acre to farmers who use minimum or reduced tillage practices that maintain a 30-percent residue cover on the ground. Participating farmers who choose no-till planting receive $6 per acre.

Through a "conservation equipment buydown" provision of this HUA project, farmers receive financial assistance on their purchases of new or used no-till drills, no-till or ridge-till planters, or ridge-till cultivators. Payment assistance is also available when farmers convert from conventional equipment to no-till or ridge-till capabilities.

USDA's Agricultural Stabilization and Conservation Service, Ohio Environmental Protection Agency, Ohio Department of Natural Resources, and Pheasants Forever offer financial help through the HUA to producers who participate in establishing filter-strips.

Michelle Lohstroh, public affairs specialist, SCS, Columbus, Ohio

philosophy regarding the community and the environment," said Hiroyuki Yoshino, president of Honda of America Manufacturing.

"Our Marysville and East Liberty plants are near the headwaters of Darby Creek. As citizens of the watershed, we want to be part of the public/private partnership that is working to protect it." Honda is preparing to install conservation practices on their properties.

The Nature Conservancy in Ohio has designated Darby Creek "a last great place." Under the banner of "Last Great Places: An Alliance for People and the Environment," the Big Darby Creek watershed joins seven domestic sites and four Latin American sites in initiating The Nature Conservancy's long-term goal of protecting entire ecosystems.

While water may take the path of least resistance, cooperation takes more work, but nets more in the long run. Each agency offers its expertise, contacts, and financial, technical, or communications assistance. Darby Creek has many partners protecting it.

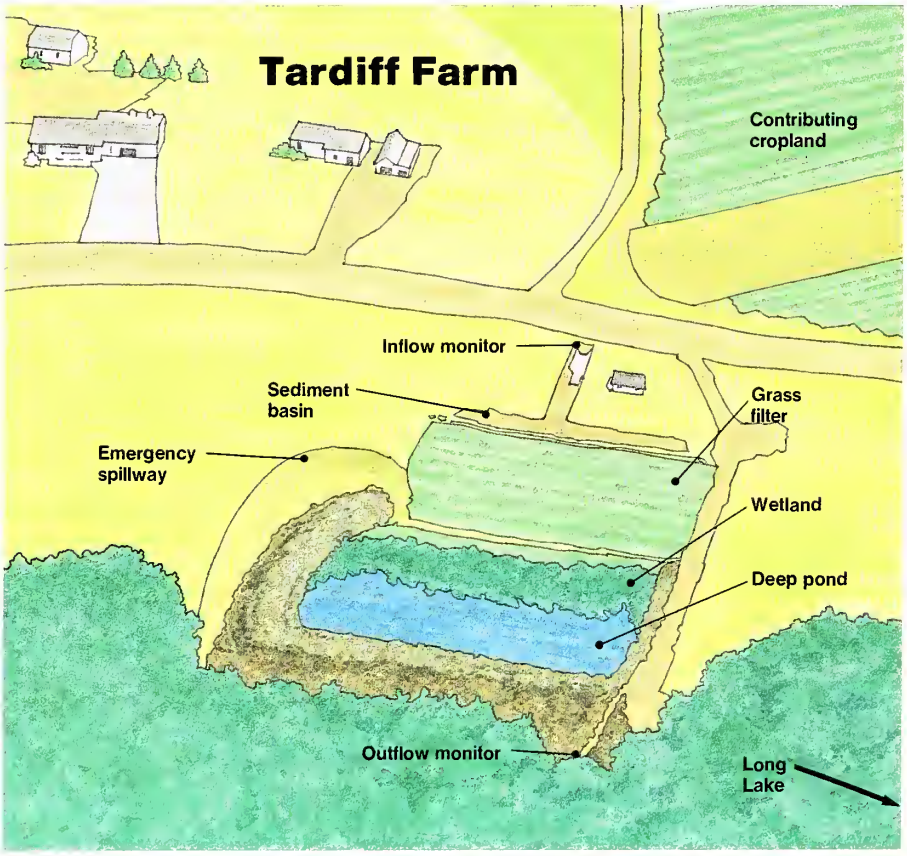
Michelle Lohstroh, public affairs specialist, SCS, Columbus, Ohio

'Living Filter' Protects Maine Lake

TAKE HALF A DOZEN proven conservation practices, combine them into a different configuration, and you have a new technique—a "living filter" that provides measurable protection to water quality.

During the mid-1980's, Long Lake in northern Maine had severe algae problems. Water quality suffered, fishing diminished, algae fouled boat propellers, and shorelines and beaches wore necklaces of green.

This lake, part of a chain of lakes and streams amid rolling acres of potato fields, provides recreation for both visitors and local residents, and thus is a key component of the area's economy.



Sediment carried from cropland on the Reginald Tardiff farm in northern Maine goes through a large culvert under the road, enters the sediment basin, percolates through the grass filter and wetland aquatics, and trickles into the deep pond. (Robert Wengrzynek photo)

Six systems have been built locally since 1988. Up to 25 more are planned in this watershed in the next 7 years.

Local citizens took steps to combat the algae problem. And the Soil Conservation Service, through the St. John Valley Soil and Water Conservation District, helped potato growers and other producers improve the results of their conservation farming.

Many farmers already were applying conventional conservation practices despite difficulties with economics, climate, soil characteristics, and land availability. Some entered the Conservation Reserve Program, placing erodible cropland under 10 years of cover.

Despite land-treatment measures, the runoff water still carried lots of sediment, nutrients, and other pollutants to the lake. Something more was needed.

The answer—designed by an interagency, multidisciplinary task force—was the nutrient and sediment-control system [hereafter called the system] that intercepts and treats runoff water.

The system is a living biological filter or treatment operation consisting of land-treatment practices and a combination of a sediment basin, grass filter, constructed wetland, deep pond, and polishing area. This system is adapted from constructed wetlands used to treat sewage and acid mine drainage.

Terraces, diversions, waterways, and tile drains are installed as needed to intercept and direct flows of surface and ground water into the system. The sediment basin collects larger soil particles and organic matter. It also regulates and distributes flows.

Sod-forming grasses, planted as a filter, receive uniformly distributed flows from the sediment basin. The filtering action also maintains an even flow into the wetland.

A constructed wetland of aquatic plants like cattails borders the 7- to 12-foot-deep pond, a part of the nutrient- and sediment-control system, on the Tardiff farm. (Robert Wengrzynek photo)

The wetland supports a dense stand of emergent aquatic vegetation and animal organisms. Cattails and other aquatics are planted. Sometimes a dike is added to maintain water depth or to direct water into the deep pond.

A 7- to 12-foot-deep pond provides a limnetic ecosystem for nutrient and fine-sediment removal. A year after construction, the pond is stocked with minnows and freshwater mussels. The minnows feed on aquatic organisms and algae. The mussels filter out nutrients, algae, and smaller aquatic organisms.

The final element, a polishing filter, is a stable, relatively level, vegetated site below the pond. This may be a grassland or a wetland, or may be forested.

USDA's Agricultural Stabilization and Conservation Service provided cost-sharing through the Agricultural Conservation Program. The State of Maine paid the balance.

The University of Maine and the Maine Department of Environmental Protection (DEP) monitored runoff from 18 acres of potato fields. Results showed a net annual average reduction between input and output of 91 percent of total suspended solids and 88 percent of total phosphorus.

"That translates into a net annual average reduction of 27 pounds of phosphorus that never gets to the lake," said Maine DEP biologist Roy Bouchard. "Over

A Few Words About Constructed Wetlands

All wetlands are not alike. In addition to those occurring naturally, wetlands may be "restored," "created," or "constructed."

To be restored, a wetland must have previously existed at the site. Created wetlands are built for multiple purposes, such as improving water quality, attracting wildlife, and mitigating wetland losses elsewhere. Constructed wetlands are built for a sole purpose: to improve water quality.

The Soil Conservation Service encourages private producers and government land managers to build constructed wetlands on their acreages. Such a wetland can treat both point and nonpoint sources of water pollution; it will cleanse the water no matter what the source.

Four basic considerations of a constructed wetland and its functioning are design, water, plants, and its role in water-quality improvement. Soils can be part of the equation, or they can be considered separately.

Construction design and water are key considerations, and are intricately tied together. Water height, how long it remains in the wetland, and how and when water exits the wetland are all important engineering decisions. Designing for these factors is best done specifically for each site.

A constructed wetland may have a synthetic liner or be built in a concrete trough. Water hyacinths are among the most useful plants to establish for water purification.

Constructed wetlands work even in colder climates. Snow and ice seem to act as insulating blankets so wetland plants can maintain life, but with reduced photosynthesis and other botanic functions.

In agricultural situations, water cleanup is most needed when cropland growth (and maintenance) is at its peak—in spring and early summer and in the autumn. Fortunately, wetland plants grow well at these times. In dairy operations, water cleanup is needed year round.

In assessing the role of a constructed wetland in water-quality improvement, it is important to determine whether the wetland will act in concert with other conservation practices to achieve an overall water-quality improvement, or whether this wetland will serve as a last resort when other conservation practices fail to improve water quality.

Ted Kupelian, public affairs specialist, SCS, Washington, D.C.

time, this system will produce substantial benefits to the lake."

Systems on three other sites, built during 1990 and 1991, are reducing phosphorus loading to Long Lake by about 1,200 pounds and reducing sediment by more than 400 tons.

Rocks placed in the inflow path effectively trap large sediment material as it enters the nutrient and sediment-control system on the Reginald Tardiff farm in northern Maine. (Robert Wengrzynek photo)

Six systems have been built since 1988. Up to 25 more are planned in this watershed in the next 7 years.

"Since that pond [in his system] was built, we've seen quite a few ducks in it," said farmer Jim Pelletier. Herons, kingfishers, raccoons, and mink feed on the fish, frogs, and mussels in the system, further enhancing nutrient removal from this living filter.

Used in tandem with other conservation practices, this "living filter" has proved to be highly effective in protecting and improving water quality.

Robert Wengrzynek, biologist, and **Dottie Laber,** public affairs specialist, SCS, Orono, Maine

SCS, EPA Share Work On Water

FOR TWO Federal agencies, a new connection began with the 1987 Clean Water Act amendment that continues today.

Under the law, the Environmental Protection Agency (EPA) asked each State's water-quality agency to name its most serious water quality problems. From the listing, the U.S. Department of Agriculture selected its demonstration project and hydrologic unit areas.

EPA also chose sites from the list, focusing on ways to provide remedial treatment for agricultural nonpoint source pollution problems. This program of water-quality projects is financed through Section 319 of the Clean Water Act, and is informally known as the 319 Program. The Soil Conservation Service is working closely on this program and others with EPA; 11 SCS liaisons to EPA are working from EPA regional offices.

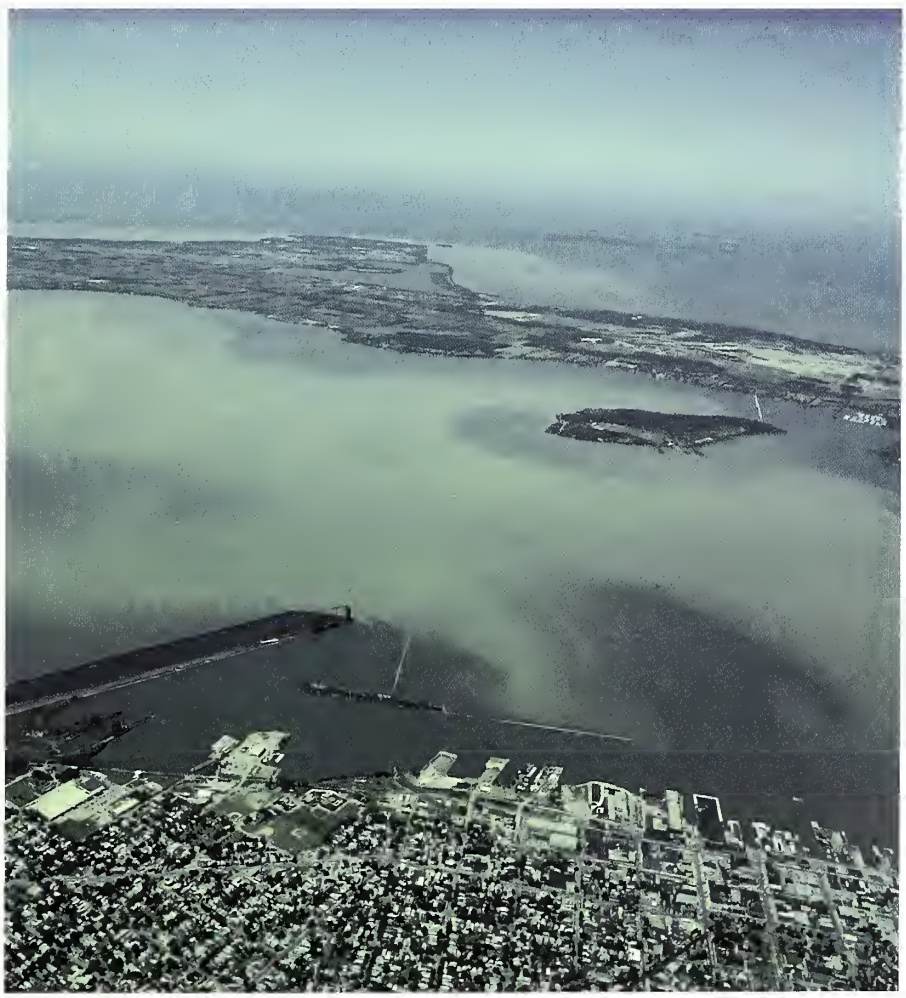
One large hydrologic unit area that has used 319 Program funds is the Upper North Bosque River watershed in north-central Texas. The challenge in this area of 290,000 acres, or 450 square miles, is excessive bacterial concentrations in the river and tributary streams. Dairy animal waste and sewage have been identified as the primary sources of the bacteria.

There has been a dramatic increase in the number and size of dairy operations in Erath and Hamilton Counties since 1987; now there are 120 dairy operations in the watershed.

The hydrologic unit focus is on dairy waste management practices, municipal and domestic wastes, cropland runoff and infiltration, and wellhead protection.

"The EPA in Texas has been using our hydrologic unit projects as a means of granting 319 Program money," noted Gary Westmoreland, SCS assistant State conservationist for water quality and water resources, Temple, Tex. "Almost everything has been connected to an existing hydrologic unit. This is a plus for us." Besides funds for the Upper North Bosque, he noted that 319 Program funds have gone to complementary work on the Seymour Aquifer hydrologic unit area.

Funds from the 319 Program in the Upper North Bosque area were granted to the Texas Institute of



Located in Lake Erie, Sandusky Bay, Ohio, is part of the Great Lakes system. Sediments in the bay show up during a major runoff after heavy rains. (Heidelberg College Water Quality Laboratory photo)

Delton Moon shows off his new settling basin on the J.T. Moon Estate Dairy. (SCS photo)

Applied Research and the Texas State Soil and Water Conservation Board to produce 15 educational factsheets. The factsheets cover specific topics affecting surface and ground water, such as septic tank siting and pesticide and nutrient management. SCS and local soil and water conservation districts distribute these factsheets to landowners and operators.

Other 319 Program funds covered a demonstration project of the criteria for siting new dairies or relocating existing dairies when an adequate waste management system could not be produced. An additional demonstration project is to evaluate the effectiveness of the best management practices being proposed for the area dairies.

The hydrologic unit area's main objective is to help dairy owners install animal waste management systems and apply management practices that can significantly reduce or prevent the potential for pollution in surface runoff and ground water.

"Each agricultural waste management system installed has included at least one waste storage pond," according to Ken Schrank, SCS project manager and district conservationist, Stephenville, Tex. For the hydrologic unit, the Agricultural Conservation Program of USDA's Agricultural Stabilization and Conservation Service and SCS' Great Plains Conservation Program have provided cost-sharing funds for construction of waste management systems.

"The improvements can be a major investment for producers," Schrank said. "In cost, they are averaging from $70 to $100 per cow." He noted that the aim for each dairy is to eliminate animal-waste discharge into nearby streams.

Funds have also covered establishing best management practices such as filter strips and field borders to retain runoff.

Within the hydrologic unit, meters have been installed in 11 dairy barns to tell how much water is being used. Samples are also collected from water leaving three of these dairies. A conservation district technician collects the samples, and the Texas Agricultural Extension Service analyzes them. The U.S. Geological Survey conducts a water quality monitoring program on the segment of the Upper North Bosque River within the hydrologic unit.

The Upper Leon, Cross Timbers, and Hamilton-Coryell soil and water conservation districts and SCS field office staffs in Stephenville, Dublin, and Hamilton are involved in the Upper North Bosque hydro-

logic unit work. The 5-year project is in its third year.

EPA's 319 Program funds are also aiding another, much smaller project. The Buzzards Bay watershed in southeastern Massachusetts is the project site where SCS soil conservationist Bernadette Taber is providing technical and planning assistance. The project is one of 17 estuaries in EPA's National Estuary Program.

Sprague Cove, located in Marion, Mass., is a small, but fairly typical cove in Buzzards Bay. The Massachusetts Division of Marine Fisheries has monitored the cove for fecal coliform bacteria on an ongoing basis. These bacteria indicate that bacterial and viral pathogens are present. Too high a number (greater than 14 counts per 100 ml of water) can cause an area to be closed for shellfishing.

Through monitoring, a stormwater discharge has been identified as the major contributor of fecal coliform bacteria to the cove. This discharge is being monitored for other pollutants such as sediments and heavy metals.

"We're trying to get Sprague Cove opened up for shellfishing again," Taber summed up as one of the project's goals.

Once monitoring is completed, representatives of the Buzzards Bay project, SCS, and the Massachusetts Department of Environmental Protection will decide on the best method to solve the stormwater-discharge problem. Taber will help the group design a specific solution. One likely candidate is construction of an artificial wetland to filter stormwater of pollutants.

"Constructed wetlands for urban-type problems would be a fairly new kind of project for SCS in Massachusetts," Taber noted with enthusiasm.

In another part of the country, $1 million was again appropriated by Congress through EPA to fund for fiscal year 1992 the Great Lakes Erosion and Sedimentation Program. Homer Hilner, State conservationist, SCS, East Lansing, Mich., is the SCS representative to the Great Lakes Commission.

"Soil erosion and sedimentation cause loss of productivity and water-quality problems throughout the Great Lakes area," said Hilner. "These funds will be used to accelerate our erosion-control efforts in the Great Lakes Basin, as well as address other water quality problems that current programs are unable to handle."

The initial funding for the Great Lakes program, awarded in fiscal year 1991, also totaled $1 million; it went to the Michigan Department of Natural Resources to prevent soil erosion in the Saginaw Bay area, and to Erie County, N.Y., and the Minnesota Pollution Control Agency.

The Commission provides program coordination in the Great Lakes area. Commission task force representatives from the eight States that border the Great Lakes, as well as EPA, SCS, and the National Association of Conservation Districts, provide input into deciding which projects will be funded each fiscal year.

SCS and EPA plan to continue their cooperation on projects to improve water quality.

Mary Jo Armstrong, associate editor, *Soil & Water Conservation News*, SCS, Washington, D.C.

At a dairy, liquid waste is used to irrigate a stand of coastal bermudagrass. (SCS photo)

One Farmer's Commitment

On Jeff England's dairy farm, a commitment to keeping surface and ground water clean is becoming a proud tradition.

England's 209-acre farm near Frederick, Md., is one of several farms in the SCS Monocacy River Water Quality Demonstration Project. Here local farmers see first hand how cost-effective practices minimize the effects of agricultural nonpoint sources of pollution on water quality. SCS has 16 project areas nationally.

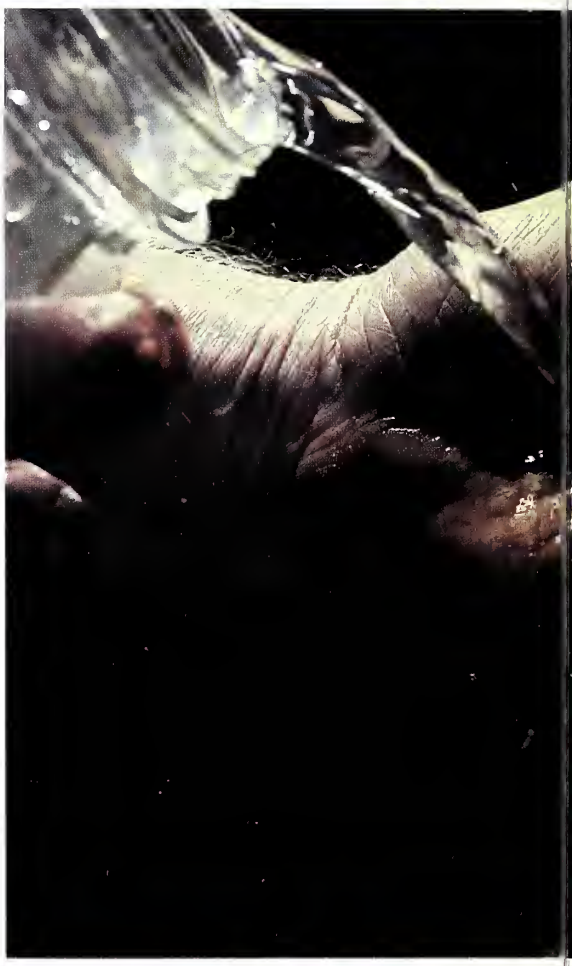
"Contour strips are the heart of our cropping system," said England. "They allow us to vary our crops and keep nutrients from washing from one place to the next. The strips require more management than open fields, but they don't allow erosion to get a running start and they reduce nutrient losses tremendously."

"We also have permanent pasture in areas where we would have constant erosion," England continued. "And we use grassed waterways to reduce nutrient runoff during heavy rains."

"Around the barnyard all the roofs are down-spouted. The concrete areas are contoured and curbed to contain runoff. And our new liquid manure handling system allows us to get the manure on the fields when we need to."

Working with the Monocacy River Water Quality Demonstration Project has many benefits, according to England. "The biggest advantage is the increased technical assistance available and the opportunity to decide where these practices fit into our program," he said. "We have seen benefits immediately, and this project also provides us an opportunity to try new practices that can improve water quality."

Tim McCabe, national photographer, SCS, Washington, D.C.



Spring water flows clean and clear. "When water leaves our farm, we're assured that it's in the same good quality as when it entered the farm," said England.

Jeff England (left) and Patty Engler, SCS soil conservationist, take soil samples from England's cropland to measure nitrogen levels. The data helps England reduce fertilizer usage and the threat of ground-water contamination from excess nitrogen.

"When water leaves our farm, we're assured it's in the same good quality as when it entered the farm."

Field scouting for crop-attacking pests has helped England use a smaller amount of pesticides, thus lessening their impact on ground water.

A new liquid manure facility provides 6 months of safe storage capacity and allows England to time manure handling with plant needs.

All photos by Tim McCabe.

Big Spring farmers cut nitrogen use [by] more than 50 tons/year...saving $150,000 to $200,000.

Chemical Use Down in Iowa Project

USE OF NITROGEN and agricultural chemicals has been reduced in northeastern Iowa, thanks to the efforts of a volunteer program designed to improve water quality.

The Big Spring Basin is a 103-square-mile area in northeastern Iowa. Because nearly all the ground water within the basin exits at Big Spring, the site is an ideal natural field laboratory for studying how agricultural activities on the surface can affect ground-water supplies.

In 1981, Big Spring was chosen as a monitoring project. Results of monitoring efforts suggested elevated levels of nitrate in the ground water. By 1983, local concern expanded the study into the research and demonstration project it is today. Thirteen Federal, State, local, and industrial groups formed the Iowa Consortium on Agriculture and Water Quality. Working together on a volunteer basis with more than 200 area farmers, these groups generated programs to encourage management practices that protect water quality in the basin.

Farmers who have reduced their use of fertilizer nitrogen since 1985 say their reasons for change were to:

- Reduce costs;
- Utilize nitrogen from manure and legume crops;
- Follow new recommendations;
- Improve ground-water quality;
- Use sustainable agriculture methods; and
- Decrease health risks.

Use of strip plots with "normal" nitrogen (N) was compared with plots having "reduced" rates. Plots with normal N rates (123 lb/acre) yielded 130 bushels/acre. Plots with reduced N rates (47 lb/acre) yielded 131 bushels/acre.

Big Spring farmers cut N use from 174 lb/acre in 1981 to 138 lb/acre in 1989. Yields during this same period rose from about 128 bushels/acre to 147 bushels/acre. This is a reduction of more than 50 tons/year of N, saving $150,000 to $200,000.

Data like this suggest that it is possible to reduce fertilizer nitrogen chemical use and yet maintain or even increase yields. Such reduced nitrogen use is generally known to improve water quality.

All projects are voluntary, and the interactive demonstration and education programs are designed to work with farmers, the agribusiness community, State institutions, and private groups.

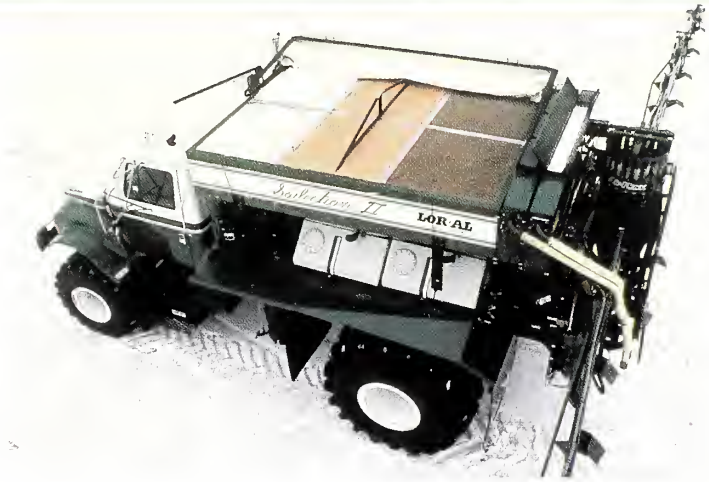
The goal is to implement the best innovative crop-production technologies available to protect soil and water resources, reduce energy consumption, and enhance the profitability of Iowa's agriculture.

Paige Mitchell, public affairs specialist intern, SCS, Des Moines, Iowa

Stripcropping in conjunction with reduced fertilizer use is being studied in natural field-laboratory situations in the Big Spring Basin, Clayton County, in northeastern Iowa. (Lynn Betts photo)

Soil maps are used to pinpoint various soil types within fields.

Fertilizer Applied As Needed



A spreader truck with six compartments for nutrients such as nitrogen and potassium helps Missouri farmers apply only the fertilizer needed. (Bill Holmes photo)

"HIGH-TECH" is one way to describe an innovative project in southeastern Missouri that is helping farmers increase profits while guarding against pollution of water supplies with agricultural chemicals.

In the 3-year project, soil maps are used to pinpoint various soil types within fields. From these maps are created computer models of fields. A specially-equipped fertilizer truck, complete with a computer, is used with the models to give areas of the field only the amount of fertilizer they require.

"When chemicals are applied at an excessive rate, there is a greater risk that they will enter the water supply through percolation to underground water or by runoff into nearby streams," said Mike Mick, Soil Conservation Service coordinator of the Bootheel Resource Conservation and Development (RC&D) Council.

Mick explained that detailed soil mapping identifies areas in fields that have significant differences in soil type and texture, organic matter, fertility levels, and water-holding capacity.

Before the extra soil mapping and soil sampling of this program (done on a 330-foot grid area) was accomplished, most farmers were unaware that various soil types existed within their fields. They often treated fields with average amounts of chemicals, which caused some areas to receive more fertilizer than needed.

The project, known as the Bootheel Ag Water Quality and Precise Application Project, is being administered by the Missouri Department of Natural Resources' (DNR) Water Pollution Control Program. Locally, Bootheel RC&D Council is playing a lead role, as are SCS and the University of Missouri Extension.

Missouri DNR is administering $93,000 of Environmental Protection Agency funds, and local farmers and farm cooperatives are adding $27,000 for the pilot project, which includes 10,500 acres in Scott, Mississippi, Stoddard, and New Madrid Counties.

Farmers pay $2 per acre to obtain soil tests and fertilizer recommendations for their fields. Soil samples are tested for soil pH and amounts of organic matter, potash, potassium, calcium, zinc, and sulphur.

Bill Holmes, who farms in Oran, Mo., inputs soil test results to a computer model of each field. He also adds the soil type boundaries and soil fertility information. Then a fertilizer truck with an onboard computer moves through the fields.

"Using this system, I expect to either produce more bushels with the same cost, or produce the same number of bushels with less cost," noted Holmes.

Soil samples were collected from 9,000 acres. Fertilizer was applied to more than 4,000 acres with the help of the truck and its computer.

Project plans are to develop a Geographic Information System and integrated related data base system to manage all pertinent data and help prescribe the proper fertilizer or pesticide application for each area of a field.

Charlie Rahm, public affairs specialist, SCS, Columbia, Mo.

Composting Improves Water Quality

SCS District Conservationist Dwight Dixon adds water to layers of dead chickens, manure, and straw to begin the decomposition process in the primary stage of Dwight Dalton's new composting facility in Polk County, Tenn. (Bob Nichols photo)

"A CHICKEN in every pot." That was the rallying cry of a major political party back in the 1920's. In 1992, that catchy slogan has nearly become a reality.

However, as chicken production increases, the high mortality rate of chickens on the farm creates a disposal problem. Poultry producers are looking for cost-effective, environmentally sound methods of dead bird disposal.

Generally they have practiced three methods of disposing of dead chickens. These are incineration, which is environmentally acceptable when properly managed but expensive because of the cost of fuel; burial in pits, which could create environmental problems, especially in areas with high ground-water tables; and rendering, which is environmentally sound but cost-effective only when the farm is located near a rendering plant. Often the disposal treatment was more disposal than treatment.

One method many producers have discovered is composting in wooden bins. Composting is a natural process in which a mixture of organic material is broken down by aerobic bacteria and fungi into a rich humus-like material or compost. It is cost-effective especially for larger producers, and is environmentally sound.

The composter contains layers of chicken manure, straw, and dead birds. Water is generally added as needed to provide the optimum moisture content for the microorganisms. The bins are usually 10 feet wide, 5 feet high, and 5 feet deep. One of the 10-foot sides is initially open, and 2- by 6-inch planks are added as layers are added to the pile. Bacterial activity in the bins causes temperatures to reach between 140 and 160 degrees Fahrenheit, which is sufficient to pasteurize the ingredients.

When the temperature begins to drop, the material is moved to a secondary bin and reaerated where it goes through a second heating. The mixing aerates and homogenizes the ingredients, and the high temperatures effectively kill all pathogenic bacteria and viruses. The total process takes about 30 to 60 days. Compost materials are usually reduced to about 70 percent of their original volume.

The poultry industry in Alabama accounts for 45 cents of every agricultural dollar earned in the State. The natural death rate for broilers is 3 to 5 percent. A farm with 100,000 broilers will lose as many as 5,000 during a 7-week growing period. This equals more than 30 tons of dead birds that must be disposed of every year. Throughout the State about 730 tons of carcasses must be disposed of each week.

In 1989, J. C. Ward and his son, Mark, poultry producers in Elba, Ala., tried a new method of disposing of dead poultry. They used a new composter design developed by the Soil Conservation Service that allowed all of the loading and unloading of bins to occur under a roof. Earlier versions were shed-type structures which required working outdoors, where bad weather could hamper loading activity. Their composting unit is a

Musser added, "the composter gives something back to the farmer; it takes an undesirable product and turns it into a fertilizer and soil amendment."

30-foot extension of a litter storage barn.

"It takes Mark and me about 30 minutes every day to take care of the birds. That's loading, covering, and wetting them down with water," said Ward. When asked if he is pleased with this system, he said, "It is one of the best investments we've made on the farm."

"The thing that amazes me about the whole process," Steve Musser, SCS district conservationist, Coffee County, said, "is that it doesn't smell...at least no more than the dry litter. It's not offensive at all. In fact, I use it on my garden all the time."

Musser has worked with the Wards from the beginning of the composting project. Musser said the Wards' unique design has attracted the attention of growers throughout the South. "I'd imagine they've had more than a thousand visitors to their place in the last 2 years. And it looks like this design is becoming the norm," said Musser.

The Wards have had the compost analyzed for nutrient content by Auburn University. The results indicate that it is slightly richer in nitrogen than regular broiler litter and acts like a slow-release fertilizer.

The composter costs about $3,000 to $4,000 for a shed-type structure for a relatively small flock. The under-roof models can cost $8,000 to $12,000, plus the cost of the dry-litter storage.

"Unlike incinerators and pits," Musser added, "the composter gives something back to the

Composting: It's Not Just for Chickens

Blue crab scrap is rich in nitrogen, phosphorus, and calcium, which are all primary plant nutrients. On the other hand it is smelly, runny, and draws flies. It's usually buried in landfills as quickly as possible once crabs are cooked and picked by local processors.

The Suwannee River Resource Conservation and Development (RC&D) Area developed a seven-county demonstration project to compost blue crab scrap in north-central Florida. The objectives of the project were to demonstrate that composting can work and can produce a high quality potting soil. The Suwannee RC&D, the University of Florida, and the Woods End Research Laboratory of Mt. Vernon, Maine, are participating in the project.

The compost is made of crab scraps, pine bark, and shredded brush. It saves the county space in the landfill and saves the wear and tear on machinery that would otherwise have to bury the material. On an average day, 10-15 tons of fresh crab scraps come into the facility. Composting eliminates the strong odor of crab scrap and provides a use for shredded yard trimmings, which are blended with the crab scrap to make compost over a 4- to 6-month period.

The Suwannee RC&D handled the market study and development. The University of Florida's Institute of Food and Agricultural Sciences conducted field trials and growth studies. Woods End Research Laboratory handled overall project management, recipe development, materials delivery, compost mixing, compost testing, and process monitoring. Taylor and Wakulla Counties provided labor, equipment, and other support for the project.

Tests have proven that tomatoes, peppers, corn, cucumbers, shrubs, and some flowers react well to the compost. University research shows that the use of crab compost reduces damage caused by nematodes.

H. Clark Gregory, "the compost man," district supervisor, Fulton County Soil and Water Conservation District, Atlanta, Ga., and composting consultant to the project.

Material in the dead chicken composting process is transferred into a secondary composting bin. (Bob Nichols photo)

farmer; it takes an undesirable product and turns it into a fertilizer and soil amendment. Let's face it, it's one of the best environmental practices to come down the pike in a long time."

Polk County, Tenn., produces over 10 million chickens annually. Most producers dispose of dead chickens in burial pits. This practice can contaminate ground and well water, creating a health hazard.

These potential water-quality concerns prompted Dwight Dalton, a Polk County poultry producer; Dwight Dickson, Soil Conservation Service district conservationist; and Todd Thurston, SCS area conservationist, to design and complete Tennessee's first poultry-waste composting facility.

USDA's Agricultural Stabilization and Conservation Service (ASCS), the Polk County Soil Conservation District, and SCS cooperated in the project. ASCS cost-shared 75 percent of the project through a 3-year long-term agreement with the district.

The facility has four primary composting bins, a secondary composting bin, and two storage areas. The primary composting bin is filled with manure, straw, birds, and water. After 7 to 10 days, the compost temperature peaks and the material is moved to the second bin for aeration and reheating. The compost is then stored.

"During the lifespan of the facility, the savings in annual fertilizer cost will pay for approximately half of the facility," said Dickson.

Accomack County, Va., is the third largest poultry-producing county in Virginia. There are 80 broiler growers; annually their gross production is 21 million chickens. Research has shown that the average producer has a daily disposal of 500 pounds of dead chickens during the growing season.

To combat this disposal problem, Virginia developed an Agricultural Conservation Program Water Quality Special Project, with $210,000 in ASCS cost-share funds to compost dead chickens and improve water quality. Fifty-seven producers have signed up to participate in the project, and 10 are currently composting.

Rodney Lewis, SCS district conservationist for Accomack County, said, "Producers Tyson and Perdue were instrumental in getting the project off the ground."

He also said the State and local governments along with private industry supported the project and participated in the education phase of the plan. The Virginia Department of Shellfish Sanitation will begin monitoring test wells for fecal coliform bacteria.

The North Carolina Region H Resource Conservation and Development (RC&D) Area, serving Anson, Montgomery, Moore, and Richmond Counties in North Carolina, is conducting a composting project. The project was funded through Perdue Farms and SCS. The money was used to construct a demonstration/research compost facility in each of the four counties.

According to North Carolina State Department of Agriculture reports, 75 compost permits have been issued to North Carolina producers, with an average of 5 to 6 requests per week.

Alabama, Tennessee, Virginia, and North Carolina are just four among many poultry-producing States that are having success dealing with poultry waste in a way that helps protect the environment.

At the end of the composting process, material is applied to cropland. (Bob Nichols photo)

Contributing to this story were SCS employees **Victor W. E. Payne, Jr.**, environmental engineer, Auburn, Ala.; **Larry Blick**, public affairs specialist, Nashville, Tenn.; **Lisa Sizemore**, public affairs specialist, Richmond, Va.; **John Caviness**, RC&D director, Region H RC&D, Rockingham, N.C.; and **Kim Berry-Brown**, contributing editor, *Soil & Water Conservation News*, Washington, D.C.

Mike Schulist...who completed Farm-A-Syst...feels he benefited from it..."We were able to pinpoint some risks before they became big problems."

Farm-A-Syst: Rx for Safe Ground Water In Wisconsin

Bill Ebert, wellhead project manager, left, and Mike Schulist, who farms northeast of Stevens Point, Wisc., discuss proper installation of above-ground petroleum storage tanks for diesel and gasoline while completing a Farm-A-Syst worksheet. (Dean P. Moberg photo)

NEED A prescription for healthy ground water? Central Wisconsin farmers involved in the Stevens Point-Whiting-Plover Wellhead Protection Project use a tool called Farm-A-Syst to safeguard their drinking water.

The wellhead project, a U.S. Department of Agriculture hydrologic unit of 106 square miles, began using Farm-A-Syst in March 1991 during individual visits to farms and at group meetings. The Soil Conservation Service is also providing technical assistance to landowners in this area.

In the project area, 96 farms lie upgradient of municipal and private wells that supply drinking water for over 40,000 people. Consequently, ground-water protection on the farm means ground-water protection for an entire community.

An abbreviation for "Farmstead Assessment System," Farm-A-Syst is a series of worksheets with multiple-choice questions developed by specialists at the University of Wisconsin, University of Minnesota, and the Environmental Protection Agency.

"Most farmers like Farm-A-Syst because it keeps their family's drinking water safe," said Bill Ebert, project manager. "But many also feel it reduces the chances of a major contamination incident and subsequent expensive cleanup costs, fines, and lawsuits."

Farmers complete 12 worksheets, answering questions about their wells, pesticide and fertilizer storage, septic systems, use of phazardous chemicals, petroleum storage, manure systems, milkhouse waste disposal, silage storage, soils, and geology.

Farm-A-Syst worksheets were designed to immediately identify risks associated with specific practices on farmsteads. As they proceed, farmers record high-risk practices on a summary sheet. This sheet serves as the beginning of their ground-water protection plan.

"Since modern farms can't survive without using or producing at least some possible farmstead ground-water contaminants, it's no wonder farmers often feel overwhelmed about ground-water protection," said Ebert.

"Some farmers come to a group meeting with a host of vague fears about ground-water contamination," Ebert added. "But they leave with a short list of two or three items they really need to act on."

It takes 2 to 3 hours for project staff to help farmers complete Farm-A-Syst on their property. Meetings to help groups of farmers complete Farm-A-Syst usually require 5 to 6 hours. Farmers have the option of providing their Farm-A-Syst results anonymously, if they think they might be singled out as polluters.

Mike Schulist is a young dairy farmer who completed Farm-A-Syst during spring 1991 and feels he benefited from it.

"We were able to pinpoint some risks before they became big problems," said Schulist. "Farm-A-Syst was one of the reasons I removed my underground fuel tank and replaced it with above-ground storage."

Dean P. Moberg, education coordinator, Stevens Point-Whiting-Plover Wellhead Protection Project, Stevens Point, Wisc.

Farmers Change Practices

THE ANOKA Sand Plain Water Quality Demonstration Project features Minnesota farmers demonstrating best management practices (BMP) to other farmers.

Use of these BMP's is aimed at improving water quality and conserving soil and other resources. The 5-year project is sponsored by USDA's Soil Conservation Service and Agricultural Stabilization and Conservation Service, and the Minnesota Extension Service. It works in 11 central and east-central Minnesota counties.

"We formed an association to help resolve water-quality problems in the Anoka Sand Plain (ASP) aquifer area," noted Jerry Bechtold, chairman, ASP Association of Soil and Water Conservation Districts.

Under the project, the ASP Association and sponsoring agencies demonstrate BMP's to farmers and nonfarm neighbors and use BMP consultants to help farmers improve their farming operations.

"I'm happy that I signed up as a cooperator," said Dike Holcombe, who raises corn, soybeans, and alfalfa on his Sherburne County farm. "Because of the ASP project, I only spent half as much for weed control in 1991 because I used banding of herbicides rather than broadcast application methods that I used before.

"With help from BMP consultant Don Schuster and Sherburne County extension agent Ken Olsen, I obtained a loan to buy a cultivator with a guidance system," Holcombe said. "This cultivator-sidedress application system will 'knife' fertilizer close to the crop row where it's most needed without causing cultivator blight. It will also help me reduce fuel costs, soil erosion, and soil compaction, and help me save time and money."

When Jim Jensen plowed under alfalfa on his 1,600-acre Isanti County farm, he was not sure about the availability of nitrogen from the alfalfa to his next year's corn crop.

Dike Holcombe, left, farmer in Sherburne County, Minn., discusses his conservation plan with BMP consultant Don Schuster, SCS, Becker, Minn. (Michael Price photo)

"I wanted to keep excess nitrogen from going into the aquifer," recalled Jensen. "My BMP consultant Jeff King helped me improve my management of nutrients and scout my crop for pests."

Through the ASP project, Jensen, the Environmental Protection Agency, and the Universities of Minnesota and Wisconsin helped evaluate the Farmstead Assessment System (Farm-A-Syst)*, which inventories a variety of farmstead operations and evaluates the risk potentials involved in the landowner's handling and storage of fuel, manure, fertilizers, and pesticides.

Agencies involved in the ASP project employ tours, demonstrations, a slide/video program, brochures, newsletters, a display, and coverage by the local media to explain the project's technical aspects to area farmers and others.

"Farming is an important industry—not just to farmers, but to all of us," noted Leslie Schumacher, Sherburne County commissioner. "As farmers improve their management of water, it benefits all citizens in the ASP project area."

"Farmers are applying BMP's to improve nutrient management, pest management, water management, and erosion control," summed up Gary Nordstrom, SCS State conservationist, St. Paul, Minn.

Michael Price, public affairs specialist, SCS, St. Paul, Minn.; **Don Schuster**, SCS BMP consultant, Becker, Minn.; and **Jeff King**, Minnesota Extension Service BMP consultant, Becker, Minn.

* See related article , page 19.

NEWS Briefs

USDA To Evaluate Water-Quality Projects

As part of the President's Water Quality Initiative, 16 U.S. Department of Agriculture (USDA) water-quality projects have been selected for assessment of their effects on water quality.

A paramount aim of USDA, under the President's Initiative, is to provide agricultural producers with the knowledge and means to voluntarily take action on their water-quality concerns. The 16 projects were chosen from 90 new USDA projects that will address, over the next 4 to 5 years, the impact of agricultural practices on surface and ground-water quality. The projects are under the joint leadership of USDA's Soil Conservation Service, Extension Service, and Agricultural Stabilization and Conservation Service.

The 16 projects represent a broad spectrum of physical conditions—soil, terrain, hydrology, and climate and farm types and agricultural practices. The projects are located in Alabama, California, Delaware, Florida, Illinois, Indiana, Maryland, Michigan, Minnesota, Nebraska, New York, North Carolina, Oregon, Texas, Utah, and Wisconsin.

Because it is difficult to accurately relate improvements in water quality to specific changes in agricultural management, the assessment will emphasize the implementation of land-treatment measures that improve the efficiency of nutrient and pesticide use on problem soils.

The assessment team will ensure accuracy of data by monitoring the work of project staff and providing technical assistance and training.

The findings will be applied in developing future USDA water-quality programs. Assessment reports are expected to be available in March 1993 and March 1995.

John Sutton, agricultural economist, SCS, Washington, D.C.

'Rent-A-Drill' Wins Award For Georgia

Georgia's No-Tillage Assistance Program was named one of ten winners of the 1991 Innovations in State and Local Government Awards.

These awards, sponsored by the Ford Foundation and the John F. Kennedy School of Government at Harvard University, recognize some of the Nation's most successful and creative government projects.

Each winning organization receives a $100,000 grant. Georgia officials plan to use their grant for education and outreach efforts, particularly to encourage more minority and low-income farmers in the State to use the no-till method.

The No-Tillage Assistance Program, known locally as "Rent-A-Drill," enables small-scale farmers to lease expensive equipment at a low cost. Thus far, the program has helped 2,045 farmers plant crops on more than 55,300 acres and has reduced soil erosion by

The No-Tillage Assistance Program in Georgia is very popular with small-scale farmers. It enables them to lease no-till drills and tractors for $12 to $15 per acre. (Jerry Boling photo)

200,000 tons. "Rent-A-Drill" has also created new partnerships between farm-related State, Federal, and local organizations to help family farmers struggling to preserve their way of life.

The No-Tillage Assistance program is funded through oil overcharge funds by the Governor's Office of Energy Resources and is administered through the Georgia Soil and Water Conservation Commission. The State's Resource Conservation and Development Councils, along with local volunteer organizations, buy the necessary equipment and work with local soil and water conservation districts and the Soil Conservation Service to rent it to landowners.

A no-tillage drill and a tractor cost $30,000, which is too expensive for most farmers. However, the "Rent-A-Drill" program puts this equipment within reach by charging participating farmers a fee of $12 to $15 per acre. There are currently 57 no-till drills serving 117 of Georgia's 159 counties, and the drills are available to every farmer in the State.

Program evaluators say the Georgia program can be duplicated in any part of the country. Every State receives oil overcharge funds that could be used to finance such a program, and every State has farm-related organizations similar to those in Georgia. At least 13 other States are now attempting to implement a no-tillage assistance program.

Diane Holcomb, public affairs specialist, SCS, Athens, Ga.

SCS'ers Get 'Hands-On' Training

The Little River/Rooty Creek Hydrologic Unit Area (HUA) Project was developed to address nonpoint source pollution from cropland and dairy, beef, turkey, and chicken operations in the Piedmont area of Georgia.

Soil Conservation Service employees who worked on the project received valuable training, according to Barbara McWhorter, soil conservationist in Madison, Ga. SCS'ers planned, designed, and constructed the manure-stacking facility—a first-time experience for these employees. It was also their first time using laser levels when surveying.

Other project work included computer planning, working with the Agricultural Stabilization and Conservation Service on cost-share agreements, and follow-up.

Doug Towery, soil conservationalist, SCS, Eatonton, Ga., uses a computer to assist in project planning.

News Briefs is compiled and edited by **Kim Berry-Brown,** contributing editor, *Soil & Water Conservation News.*

NEW in Print

Pesticides and Groundwater: A Guide for the Pesticide User

By the Northeast Regional Agricultural Engineering Service

This guide was written for pesticide users and rural residents concerned with protecting ground-water resources. It identifies site factors, pesticide properties, and application processes that increase the risk of ground-water contamination.

Processes are described that replenish ground water and play a role in moving contaminants to the ground water.

The publication also contains an easy-to-follow explanation of environmental factors which affect the movement of pesticides to ground water. Pesticide properties, soil properties, and site factors are explained and compared.

Integrated pest management is suggested as a means to save on pesticide costs and to reduce the chance for pesticide contamination. Other sections cover safe handling of pesticides and health concerns.

This 17-page booklet is available for $3.25 from the Northeast Regional Agricultural Engineering Service, 152 Riley-Robb Hall, Cooperative Extension, Ithaca, NY 14853; telephone 607/255-7654.

Water in Your Hands

(English & Spanish)

By the Soil and Water Conservation Society

These educational releases from the Soil and Water Conservation Society (SWCS) focus on the awareness of water quality and its management problems. Both English and Spanish language versions are available.

In the booklets, readers will experience with 6th grade students Martin and Heidi and cartoon character Fresh Water an adventure spanning millions of years and covering water-quality and supply issues around the world.

Emphasis is on motivating students and developing their skills so they can become responsible citizens regarding water resources.

An instructor's guide to facilitate the use of the booklet in formal and informal education settings is also available. In file folder-format, the guide includes four activity masters; three pages of objectives; background information; implementation suggestions; sources of additional educational information; and an array of optional, hands-on multidisciplinary activities.

The booklet was created with the guidance of an advisory committee of water resource management experts and educators that included the Soil Conservation Service.

Single copies of the 16-page, full-color, illustrated booklet, in either English or Spanish, are 75 cents. The instructor's guide (in English) is $2.00. Volume discounts are available. Order through SWCS, 7515 NE Ankeny Road, Ankeny, IA 50021-9764; telephone 1-800/THE-SOIL.

New in Print is prepared by **Paul G. DuMont**, associate editor, *Soil & Water Conservation News*.

Conservation Calendar

May	
4-10	Public Service Recognition Week; Contact: Public Employee's Roundtable 202/927-5000
27-29	President's Council on Rural America Meeting, Williamsburg, Pa.; Contact: 202/690-2394
June	
14-18	9th Annual National American Society for Surface Mining and Reclamation Meeting, Duluth, Minn.; Contact: Samuel K. Dickinson 218/326-2044
21-24	American Society of Agricultural Engineers International Summer Meeting, Charlotte, N.C.; Contact: Jon Hiler 616/429-3852
28-July 1	American Water Resources Association National Forum on Water Management Policy, Washington, D.C.; Contact: 202/720-2520
July	
3-8	National Education Association Conference, Washington, D.C.; Contact: 202/822-7750
6-9	Sixth International Conference of the International Institute of Fisheries, Economics, and Trade, Paris, France; Contact: Ann Shriver 503/737-6428
28-30	National Livestock, Poultry, Aquaculture Residuals Management Priorities Workshop, Kansas City, Mo., Contact: Dr. Richard Reynnells 202/720-4087
August	
3-7	American Society for Photogrammetry and Remote Sensing/American Congress on Surveying and Mapping and Resource Technology Convention, Washington, D.C.; Contact: Alan Voss 615/751-5425
9-12	47th Soil and Water Conservation Society Annual Meeting, Baltimore, Md.; Contact: Larry D. Davis 515/289-2331
16-21	9th International Biotechnology Congress, Arlington, Va.; Contact: American Chemical Society 202/872-4600

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